

DATA SHEET FOR GAS QUALITY IN THE TYRA REDEVOLPEMENT PERIOD

The Tyra redevelopment period of approximately 3 years, beginning on 21. September 2019, will reduce the supply of gas from the North Sea significantly. This means that the Danish and Swedish gas market will be supplied from other sources in the redevelopment period.

This change of gas supply to the Danish and Swedish gas market will lead to changes in the gas quality. The Danish and Swedish gas market, will be supplied from these 4 supply sources:

- Imported gas from Germany
- Biomethane
- Gas from Danish gas storages (Lille Torup & Stenlille)
- North Sea gas from Syd Arne.

The primary source of gas will be import from Germany via Ellund. Gas from Germany, will either be Russian or mixed German gas. The Russian gas is chemically characterized with a lower mole-% content of propane, butanes and pentanes, than the mixed German gas. This results in a lower upper calorific value.

The mixed German gas consists of local produced gas, and other H-gas, which can be of Dutch or Norwegian origin. The gas quality of mixed German gas, will have greater variations, due to the underlying sources.

During the redevelopment of Tyra, biomethane will contribute to a better supply situation in the Danish and Swedish gas market. Biomethane in the gas net represents around 10 % of the Danish gas consumption. This will expectedly increase in the future. The combustion of biomethane is technically like natural gas.

The Danish gas storage facilities have a capacity equal to approximately 25 % of the yearly consumption in the Danish and Swedish gas market. This means, that for the coming winter period 2019-2020, the supply from the storage facility will be North Sea gas from Tyra and Syd Arne. Therefore, in the winter period 2019-2020, the Danish and Swedish gas market will be supplied from a higher proportion of North Sea gas, than later in the redevelopment period.

The legal basis for gas consumption in Denmark is stipulated in requirements for the gas quality made by "Bekendtgørelse om gaskvalitet". Also "Rules for Gas transport" sets specifications for transport of gas. Gas transported in Energinet's transmission system will always stay within the legal limit. The legal technical combustion requirements can be seen in table [1]:

	Min Value	Max Value
Wobbe index [kWh/Nm ³] ¹	14.1	15.5
Relative density [-]	0.555	0.700

¹ A special preparedness plan for Ellund Border has been approved by the Danish Safety Technology Authority allowing gas with Wobbe index between 50,04 MJ/Nm³ to 55,8 MJ/Nm³ (13,9-14,1 kWh/Nm³) to be imported

Changes of upper calorific value and Wobbe index for North Sea gas in the period of Tyra redevelopment are to be expected. This is due to the absence of gas from the Tyra-platform.

The expected variations of upper calorific value and Wobbe index for the winter period 2019-2020 can be seen in table [2]:

	Upper calorific value [kWh/Nm ³]	Wobbe index [kWh/Nm ³]
Imported gas from Germany	11.1-11.6	14.4-15.0
Biomethane	10.8-11.3	14.4-14.9
Gas from Danish gas storages	11.7-12.4	14.8-15.3
North Sea gas	11.8-12.7	14.3-15.3

Changed gas qualities are expected to occur in the redevelopment period. Furthermore, greater variations may be expected, due to different supply sources.

The Russian gas has less variations of gas quality than North Sea gas. Therefore, less greater variations of imported gas are to be expected.

Table [3] shows examples of supplies gas qualities, for the period of Tyra redevelopment.

		Example of expected gas quality of German gas at import	Example of expected gas quality of Russian gas at import	Example of expected gas quality for North Sea after 2019	Example of Danish gas from storages for the winter period 2019-2020	Example of biomethane quality in transmission
Methane	mole - %	89.85	96.19	85.67	89.06	98.30
Ethane	mole - %	5.01	2.82	7.87	5.83	0
Propane	mole - %	1.01	0.15	3.61	2.42	0
I-butane	mole - %	0.10	0.048	0.26	0.41	0
N-butane	mole - %	0.12	0.032	0.73	0.64	0
I-pentane	mole - %	0.021	0.0074	0.087	0.15	0
N-pentane	mole - %	0.017	0.0047	0.0976	0.11	0
Hexane+	mole - %	0.016	0.0061	0.0370	0.059	0
Nitrogen	mole - %	2.53	0.34	0.3909	0.30	0.33
Oxygen	mole - %	0	0	0	0	0.21
Carbon dioxide	mole - %	1.33	0.40	1.30	0.91	0.33
Gross calorific value	kWh/Nm ³	11.30	11.27	11.98	12.18	10.87
Gross calorific value	MJ/Nm ³	40.67	40.57	44.86	43.86	39.15
Wobbe index	kWh/Nm ³	14.38	14.83	15.31	15.24	14.52
Wobbe index	MJ/Nm ³	51.78	53.40	55.13	54.86	52.29
Relative density	-	0.617	0.577	0.662	0.638	0.556
Normal density	kg/Nm ³	0.798	0.746	0.856	0.825	0.718

Table 3: Expected gas compositions and qualities for imported gas. North Sea gas and biomethane.

As shown in table [3], great variations of gas quality may occur, due to different supply sources. In the winter period 2019-2020, the gas in the Danish gas storages facilities will be different from North Sea gas after 2019. This is due to storage of gas from Tyra and Syd Arne in a period before the redevelopment. Data showing the gas qualities can be found via Energi data service.

References

Regler for Gastransport (RfG) <https://en.energinet.dk/Gas/Rules>

Bekendtgørelse om gaskvalitet Can be found at Sikkerhedsstyrelsens (SIKs) website <http://www.sik.dk/>

Further questions can be asked at: gaskvalitet@energinet.dk

Energi data service Data for gas can be found via Energi data service website <https://www.energidataservice.dk/>